Lake Clear PCB Remedial Project

Summary Report to

Ontario Ministry of the Environment

July 1983

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Lavalin

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20 July 1983

Ministry of the Environment
133 Dalton Street
Kingston, Ontario
K7L 4X6

Attention: Mr. L. Fitz

Lake Clear PCB Remedial Project
Summary Report

Dear Sir:

We are pleased to submit herewith our Summary Report on the Lake Clear PCB Remedial Project in Sebastapol Township.

We appreciate the opportunity to have been of service to the Ministry in this matter, and wish to thank those members of your staff who assisted on the project.

All of which is respectfully submitted.

Yours very truly,

MacLAREN ENGINEERS INC.

Hellen Cornfield

H.W. Cornfield, P.Eng.
Project Director

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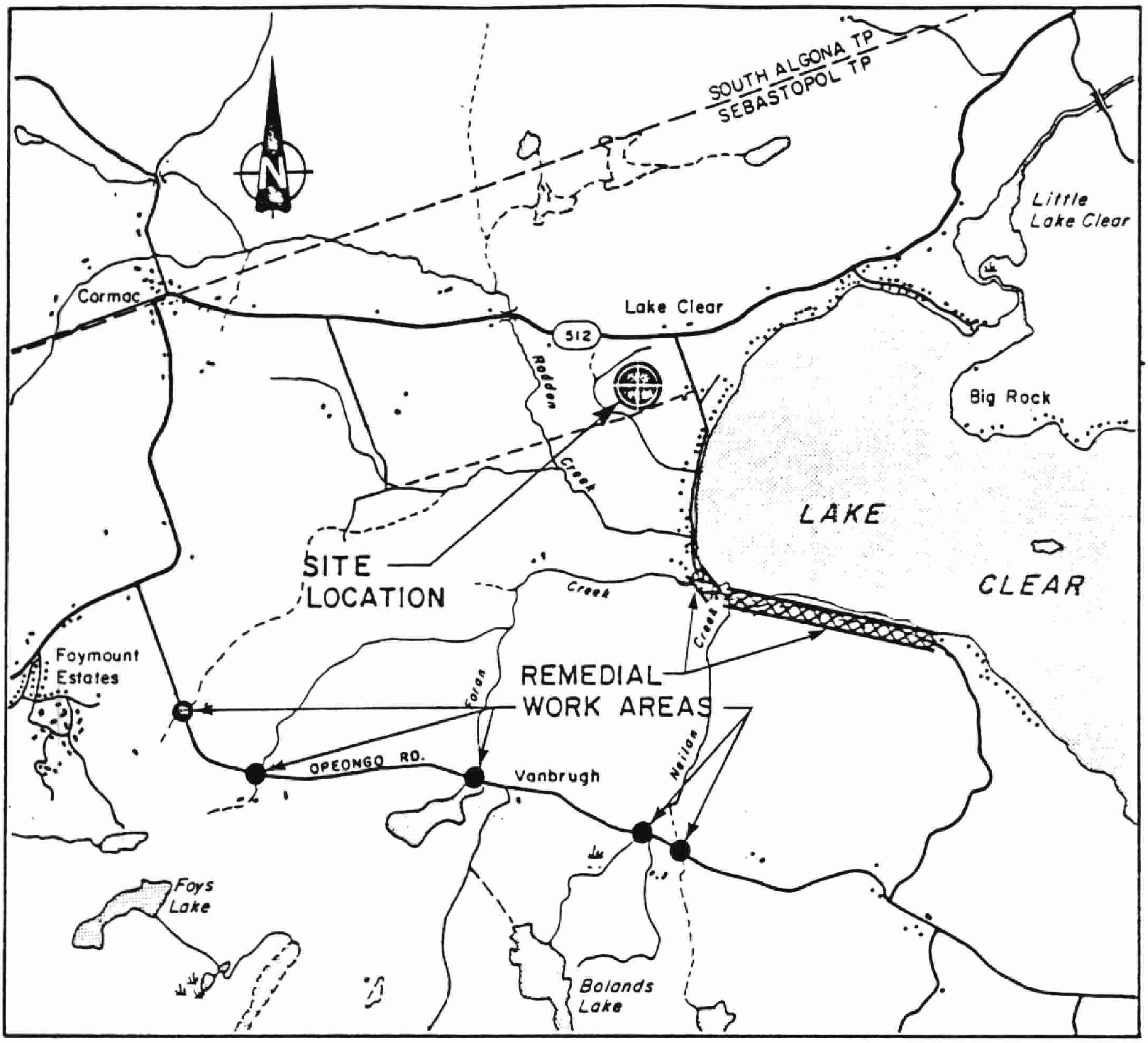
1.0 Introduction

The existence of PCB contamination in the Lake Clear area was first suspected in 1979, when the results of the 1978 fish contaminant monitoring program were known and indicated elevated levels of the substance in the tested specimens. Further fish testing performed through 1979 and 1980 confirmed the presence of rather high levels of PCB contamination and prompted the Ministry to initiate source investigations in mid-1981. A news release outlining the potential hazard was issued in July 1981.

Although contaminant levels in fish were sufficiently high to require four species to be placed on the Restricted Consumption Status as of February 1982, the source investigations found all drinking water supplies in the Lake Clear Area to be free from PCB contamination and acceptable for consumption. Measurable levels were found in lake water but these were still well below the drinking water standard.

The source investigations eventually indicated that PCBs were contained in all sections of roadway that had been previously oiled during the 1972-1977 period. In particular, sections of Lake Clear Road along the west and southwest shorelines and portions of Opeongo Road were found to contain high levels of PCB and were identified as major potential sources contributing PCB contamination into Lake Clear (see Figure 2.1).

Note: Figure numbers relate to Report and Technical Discussion numbering system.



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STUDY AREA

FIGURE 2·1

Even with the substantial tracking of the PCB levels over the past few years, it has not been possible to definitely assess the overall impact on the surroundings of the present and future inputs of PCB into Lake Clear. It is evident, however, that after rapid initial loss of contaminated oils due to surface runoff and air-borne dust particulates, the process of translocation of contaminates into the lake is continuing, although at a reduced rate. It was, therefore, deemed necessary to implement a remedial program aimed at achieving the maximum feasible reduction of the significant sources contributing PCBs to Lake Clear. Such a program, although not eliminating entirely all sources, would speed up the decline of measured levels in the fish and maintain levels well below the drinking water standard.

In March 1983, the Ontario Ministry of the Environment retained MacLaren Engineers Inc. to design and manage the removal and disposal of PCB-contaminated material in the Lake Clear area of Sebastopol Township. The first phase was to carry out an engineering study, the results of which are presented herein.

The field investigation program conducted by Ministry staff has provided a significantly large amount of data on the PCB levels under and along the Lake Clear and Opeongo Roads, both on the surface and at depths of up to 0.5 meters. The distribution and density of the sample points adequately cover the roadway areas around the lake which have the potential of being significant contributors as a result of past oiling procedures. This, together with the test results, suggests that the Remedial Work areas outlined in the next section will provide for the removal of the significant PCB source materials.

2.0 Areas of Remedial Work

The source investigations indicated that PCBs are evident in most roadways in the Lake Clear area as a result of past road oiling. The measured levels vary considerably from location to location from "barely detectable" to "significantly high".

The total collection and containment of all PCB- contaminated soil around Lake Clear was deemed not practical. The thrust of the proposed remedial program is, therefore, to remove those areas of contaminated soil which would be expected to make a significant contribution to the measured PCB levels in the Lake Clear sport fish. Once removed, the contaminated materials would be stored permanently in a safe and environmentally acceptable manner.

Based on site testing in 1982 and lastly in April 1983, the following areas were identified as significant sources and thereby slated for remedial work:

Lake Clear Road	- 20 metres west to 60 metres east of Foran Creek - roadway and shoulders
Lake Clear Road	- 10 metres west to 300 metres east of Nelian Creek - roadway and shoulders
Lake Clear Road	- 1600 metres commencing approximately 300 metres east of Nelian Creek - shoulders only
Opeongo Road	- five stream crossing locations - shoulders only

These areas are also shown on Figure 2.1.

The contaminated material, once removed from the roadways and shoulders, will be taken to a disposal site on Crown-owned land directly west of Lake Clear. After the removal of the contaminated material, the roadways, shoulders and ditches will be restored to their original configurations.

3.0 Remedial Program Overview

The overall thrust of the remedial program is to achieve a major reduction of the significant PCB sources by removing and/or treating the contaminated material so as to render the known transport processes now at work ineffectual to the point where PCB levels reaching the lake are well below acceptable levels.

The methods to be employed in carrying out the program are intended to achieve a comprehensive and environmentally acceptable solution to the problem. The methods outlined below and in more detail in the accompanying Technical Discussion also represent established technology which has been employed to isolate PCBs and other hazardous materials from the balance of the environment for the foreseeable future.

3.1 Contaminated Material Treatment

The criteria used in defining the areas of significant sources vary depending on the location (i.e. distance from lake) and the transport mechanism at work in the specific location. The identified contaminated zones will be treated in two basic ways depending on location and the potential of migration from the source:

- In the more significant locations, contaminated materials will be excavated and completely removed from present location for off-site disposal.

- In less significant source areas, contaminated materials will be left in place and the surrounding conditions altered to render the current transport processes essentially ineffective.

The latter approach is to be used for sections of the travelled portion of the Lake Clear Road somewhat distant from the lake and for the locations identified on the Opeongo Road. In these locations, the porous road shoulders will be removed completely and replaced. The travelled portion will be asphalt paved and the roadside drainage will be improved in order to minimize surface water infiltration into the road bed material.

3.2 Contaminated Material Disposal

The contaminated material picked up from the delineated areas will be removed from its present location to a designated disposal site for final disposal. In general terms, the approach to be taken involves the incorporation of the contaminated soils into a large mass of very low permeability through a cementatious process, then burying the mass in a suitably designed site. Once complete, the contaminants would be so constrained that, should PCB discharge from the mass occur in time, the release rate will be significantly below acceptable levels.

The proposed disposal site is located on Crown land some 600 meters from Lake Clear and isolated from even the nearest local residents. The topographically elevated site is a sandy to silty and stoney till knoll surrounded by sand-silt sediments. Ground water is approximately five to six meters deep and flows southward. The site is considered more than suitable provided the disposal mass is kept clear of the water table.

To design the cementatious disposal mix, samples of the material were collected and a series of lab tests run to determine the mix specifications required to achieve a low permeability in the order of 10^{-7} cm/s. The results indicated that a mix containing 10% cement and compacted to 95% Standard Proctor Density will achieve in-site densities in the order of 10^{-7} cm/s.

The disposal site will be excavated to a level two meters above the high water table and then the disposal mix placed in the site. The placing process will ensure that a monolithic, more or less homogenous mass is achieved. The surface will be graded to shed water percolating down through the cover. Upon depositing all contaminated material, the mass will be covered over with two meters of soil and surface vegetation restored to its present state.

3.3 Future Monitoring

Implementation of the remedial measures outlined in this report for the removal and disposal of PCB-laden material shall result in the significant reduction and containment of the identified sources of contamination into Lake Clear.

Subsequent to the completion of the remedial works, monitoring of the PCB levels should continue in order to establish whether the ultimate goals of this clean-up program have been attained and if any further action is required.

4.0 PCB Containment

4.1 State-of-the-Art Literature Review/Previous Experience

Upon initiating the study, two literature searches were undertaken of the following data bases:

- National Technical Information Services (NTIS)
- Enviroline
- Pollution Abstracts
- Compendex
- Aqualine
- Smithsonian Science Information Exchange
- Canadian Environment

From the technical papers and reports which the literature search uncovered, most dealt with the clean up and treatment of oils directly rather than with the clean up and disposal of PCB contaminated soils. No useful references were found related to "chemical or cementation fixation" of PCB contaminated soils.

The following is a brief account of a PCB spill near Dowling, Ontario, including a summary of the studies carried out and the remedial measures adopted.

In November 1973 a truck-train collision resulted in the spillage of 1100 gallons of askarel oil adjacent to a railway-roadway intersection near Dowling, Ontario. The askarel oil contained 70 percent PCB (Aroclor 1254) and 30 percent solvent (Trichlorobenzene). Most of the spilled askarel oil was located in one quadrant of the intersection. Initial clean-up involved removal of 115 drums of PCB contaminated soil and disposal in a hazardous waste facility. In addition, 1050 tons of PCB-contaminated soil were excavated from the spill site for disposal. However, based on subsequent monitoring carried out

it was found that PCB had migrated to significant depth in the soil profile and thus further remedial measures had to be considered.

Based on a comprehensive programme of drilling and sampling, the sub-surface conditions at the spill site were defined and the extent of PCB-contaminated soil was reasonably well established. It was found that the contaminated soil zone measured some 20 x 20 m in plan and extended to a depth of about 15 m below ground surface. The groundwater level was at a depth of about 20m. PCB concentrations typically ranged from about 100 to 10,000 ppm in the upper part of the contaminated soil zone and were generally less than 1 ppm in the lower part. There was no general PCB contamination of the groundwater beneath the spill site.

The following remedial measures were considered during initial evaluation of the PCB spill.

a) Remove PCB-contaminated soil and place in a hazardous waste dump.
b) Contain PCB-contaminated soil in-situ with low permeability barriers.
c) Remove PCB-contaminated soil and place in a specially designed local containment facility.
d) Stabilize PCB-contaminated soil in-situ.
e) Provide a hydrodynamic containment system in the groundwater below the spill site to prevent migration of PCB from the site by groundwater flow.

The remedial scheme finally selected involved a combination of removal and containment in-situ. In this regard, the PCB-contaminated soil was removed, mixed with a stabilizing material consisting of cement, and then was placed back into

the excavation. The PCB-contaminated soil and cement mix was provided with a surficial grass-covered clay seal and good drainage was established.

This previous experience represents significant precedent in containment of PCB-contaminated soil.

4.2 Investigation of PCB-Contaminated Soils

The source identification studies of the Ministry of the Environment had defined the extent of PCB-contaminated soils to be removed and stabilized at the proposed disposal site.

4.2.1 Procedure for Field Work

A field investigation program was carried out in April 1983 to determine soil conditions in all areas slated for remedial works. Soil samples in the boreholes or test holes were generally taken continuously from surface to depths at least 0.5 m below the base of road fill before the boreholes were terminated. Special attention was given to detect the possible presence of logs or other such materials underlying the road fill since "corduroy" methods may have been used for road construction in some locations.

The results of these tests are contained in the Technical Discussion, Section 4.3.3.

4.3 Criteria for Containment Scheme

The earlier Ministry of the Environment work had established the following criteria for containment of the PCB-contaminated soil:

a) The disposal site is to be located on Crown Land in Lot 15, Concession XIII, Sebastopol Township in the vicinity of an abandoned gravel pit.

b) The PCB-contaminated soil is to be stabilized with a cementatious material and buried below grade at the selected disposal site. Stabilization with cementatious material is to bind the PCB-contaminated soil into a solid mass with sufficient strength and with a sufficiently low permeability to provide for environmentally acceptable long-term disposal.

c) An acceptable criterion for PCB in the surface water and groundwater of the property is to be less than three parts per billion.

d) A desirable criterion for PCB in surface water and groundwater off the property is to be less than three parts per billion.

4.4 Mix Design, Testing, Selection

Laboratory testing was carried out to determine the permeability and strength characteristics of representative specimens of PCB-contaminated soil when mixed with cementatious material. In addition, bentonite was also tested in the program. Testing was carried out on specimens stabilized with cement only, with both cement and bentonite and with bentonite only.

Based on the stabilization materials under consideration, the nature of the materials to be stabilized and the proposed configuration of the stabilized soil zone, it was considered that the most suitable approach to mixing and placement would be to mix the contaminated soil and stabilizing material in advance and then compact the mixture in lifts using the conventional approach involved in the use of soil cement. The laboratory testing program thus followed the general procedures which have been established for soil-cement.

The selection of the containment mix thus took into account the following factors:

a) The stabilized soil will be located above the groundwater level in the unsaturated soil zone.

b) The soil which has to be stabilized (approximately 6400 m^3) consists mainly of clean granular sand to gravelly sand. About one to two percent of the soil contains significant quantity of organics. They are considered to be well-suited for stabilization with a cementatious material.

c) The disposal site is located on a topographic high with well-developed surface drainage.

d) The objective of the containment mix is to stabilize the PCB-contaminated soil so that the potential for future migration of PCB is greatly reduced.

e) The potential for leaching out of PCB over the long term is one of the more important factors in selection of the mix design. Therefore, theoretical computations were carried out to determine the maximum quantity of water which could flow through the stabilized zone of soil for various values of hydraulic conductivity.

f) Based on the results of the hydraulic conductivity tests and the various factors discussed above, it is considered that the use of normal portland cement, or equivalent cementatious material, to stabilize the contaminated soil would represent a satisfactory approach to the problem. In this instance, it is recommended that 10 percent cement by weight of dry soil be used and that the mixture be compacted in place at optimum moisture content to at least 95 percent of Standard Proctor maximum dry density. The test results available indicate that a hydraulic conductivity value of 1×10^{-7} cm/s or less should be achieved. The compressive strength of this mix will be of sufficient magnitude to give high resistance against weathering and potential erosion.

4.5 Evaluation of Containment Scheme

The containment scheme will involve stabilization of PCB contaminated soil to a configuration measuring about 50 m x 65 m in plan and about 2.0 m to 5.0 m in depth. The stabilized soil zone will be provided with a 1.5 m thickness of soil cover material which will support a growth of vegetation. A number of factors are relevant as follows:

a) The proposed cement content of 10 percent is in the high range of cement contents which are normally used for soil-cement applications with granular soils. Under most conditions, where the soil-cement is subjected to freeze-thaw cycles and wet-dry cycles, there is substantial documentation regarding successful experience with long design life. In the proposed application the soil-cement will not be exposed to freeze-thaw and wet-dry cycles thus extending the life even further.

b) The soil-cement mass is susceptible to shrinkage. Shrinkage equivalent to about 5 mm per 10 m in the horizontal direction would be expected as vertical cracks in the soil-cement zone. These cracks would represent more porous seepage paths through the soil-cement.

c) A proportion of precipitation will infiltrate and migrate vertically downwards through the soil-cement zone to the water table. As this water passes through the soil-cement zone, some of the PCB will be taken into solution and will be carried down to the water table where it will mix with the groundwater and migrate down gradient towards the creek or lake.

Using very conservative assumptions, the concentration of PCB in the water moving off the site is 0.02 ppb. If it is assumed that the contamination remains within the upper one metre of the groundwater body then the concentration moving off the site would be 0.07 ppb. On this basis the aforementioned criteria will be achieved.

5.0 Disposal Site Investigations

The disposal site is situated on a topographically elevated area which has been mapped as a glacial sandy to silty and stony till. The surficial deposits surrounding this till knoll have been identified as glaciolacustrine sediments consisting of sand and silt.

Seven test holes were drilled to depths of between 4 and 12 metres to investigate hydrogeological conditions in the vicinity of the disposal site (see Fig. 5.3). In each test hole, soil samples were collected at 1.5 metre intervals and standpipe piezometers were installed to locate the water table, measure the hydraulic conductivity of the soil, and collect groundwater samples. The hydrogeological investigation permitted the following conclusions to be drawn about the site.

- The disposal site is located on a till unit of low hydraulic conductivity (10^{-4} to 10^{-6} m/s) surrounded by deposits of glaciolacustrine sediments consisting of sand and silt.

- The water table is located five to six metres below ground surface at the disposal site and flows in a south-easterly direction towards Lake Clear. Under the measured hydraulic gradients and permeabilities the average linear velocity appears to be in the range of 12 to 15 m/year.

- Water analysis showed that the groundwater quality is typical of water found within glacial deposits being slightly alkaline, fresh and of moderate hardness.

- The results of this study show that the site is an acceptable location in view of the proposed mix design criteria provided the soil cement mass is placed above the maximum water table level to minimize the possibility of PCBs migrating off site. The surface runoff would also be deflected around the site as part of the finishing and landscaping.

6.0 Disposal Site Design

The disposal site location (see Figure 2.1) is located on Crown land administered by the Ministry of Natural Resources. The site suitability has been hydrogeologically confirmed and it is in close proximity to the areas of contamination. The site is also relatively isolated with respect to the neighbouring residential areas and it is accessible from Lake Clear Road via Fire Route No. 2.

The design of the disposal pit was based on the premise that the bottom elevation of the pit would be at least two metres above the high ground water table and a minimum cover of two metres would cap the disposal mix. Surface drainage was designed to re-route the runoff away from the encasement area, thereby further reducing the probability of leaching. The details of the finished site are shown on Figure 6.1.

The overall site layout during construction was prepared with the intention of confining all contaminated material to the smallest area possible.

Prior to the commencement of actual mixing and land-filling operations, several items of site preparation will be required. Initially, the site office trailers and worker facilities will be installed and the access road will be upgraded. The construction and working site limits will be designated before any clearing and grubbing work is undertaken to ensure the minimum amount of disruption to the pine tree plantation. Surface drainage improvements will be made to direct the runoff away from the disposal area.

Excavation will follow these preliminary measures. Initially, topsoil will be stripped and stored for re-use in site restoration, then a working pad constructed of soil-cement is suggested to provide a solid base for the mixing equipment and to prevent contaminated soil from intermixing with native material prior to and during the mixing process. Excavation of the disposal site itself will likely be conducted concurrently with the excavation of the batching plant area.

When the batching plant and disposal site are operable, the contaminated material would be hauled to the stockpile areas and the landfilling procedures would start.

6.1 Operating Requirements

Following the preparation of the site, actual landfilling and containment of the PCBs will commence. Initially, the existing stockpile of contaminated material, including a layer of native material from under the pile, will be removed to the stockpile area beside the batching plant. The soil will be transferred from the stockpile to the batching plant to form a soil-cement mixture as previously described. From the batching plant, the soil-cement will be placed in lifts in the appropriate locations of the disposal pit spread and compacted to the specified density. Dust will be controled to inhibit the propogation of airborne PCBs.

All vehicles and equipment used for mixing, hauling, depositing and compaction of the contaminated material are to be committed to the disposal area for the duration of the work. In no circumstances should these vehicles or equipment be allowed to leave the site until adequate decontamination measures have been performed.

Fire routes to forested areas will be maintained clear for access by firefighting forces in the event of such a need.

6.2 Site Restoration

Generally, the grading and landscaping of the site will be completed to conform to the details shown in Figure 6.1. The topsoil previously stockpiled at the onset of construction will be re-spread over the disposal pit to provide a healthy base for plant regrowth. Seeding and mulching of this area is recommended at the end of construction. Re-forestation of the site is expected to follow as part of regular Ministry of Natural Resources program. The access roads to the site and fence are to be reinstated to a state at least comparable to their original condition, and all damaged trees are to be properly pruned. In addition, all equipment, material and refuse shall be removed from the disposal site upon completion of the works.

7.0 Roadway Remedial Work

The roadway section destroyed by removal of contaminated materials will be reconstructed as follows:

a) Opeongo Road

Following detail design of all remedial works, the contract drawings will be submitted to the Township and MTC for review and approval.

The existing creek crossings, identified on Opeongo Road, will have the gravel shoulders completely removed down to existing sub-grade levels on both sides of the roadway. New granular materials will be imported to rebuild the shoulders.

Reconstruction of the shoulders will consist of the replacement of:

i) granular 'B' from existing sub-base to 250 mm below pavement grade;
ii) 250 mm granular 'A'; and
iii) reinstatement of guide posts and ditches, including sodding or seeding.
iv) full width of road will be capped with a layer of asphalt.

b) Lake Clear Road

Along Lake Clear Road, two separate sections will be reconstructed. Complete roadway rehabilitation is required at Foran and Neilan Creeks, and

shoulder rehabilitation and drainage improvements are required from 300 m east of Neilan Creek, for some 1600 m easterly.

i) Complete Roadway Rehabilitation - At Foran and Neilan Creeks, the roadway will be completely sub-excavated to an approximate depth of 0.5 m, from the shoreline southerly to 3 m south of the roadway. The roadway, where it traverses the bog at Neilan Creek, is partially built over corduroy which must be retained as a base for the reconstructed roadway. A separate and simultaneous contract will be awarded to replace the existing bridge at Foran Creek with new culverts.

It may also be necessary to provide protective measures, to ensure:

i) that siltation of the lake from the excavation does not occur due to storm water run-off; and
ii) that wave damage to the excavation can be prevented.

The requirements for the protective measures will depend, to a large extent, on the prevailing lake water level and the staging at the time of construction. If necessary, the lake level will be lowered by means of the control structure managed by Renfrew Hydro.

The complete roadway will be reconstructed to local standards for granular material thicknesses and surface treatment. An interceptor ditch at the south side of the roadway will be constructed to provide positive drainage.

ii) Shoulder Rehabilitation and Drainage Improvements -

The section is about 1600 m long and the profile of the roadway, in an easterly direction, is a generally rising gradient.

The shoulders will be completely reconstructed to match existing granular material depths generally as noted in a) above. Existing culverts will be replaced if deemed necessary, depending on their condition. The south ditch will be reconstructed, where required, to provide positive drainage and maintain the water level in the ditch at least 0.5 m below the road level to minimize the flow of water across the road granular materials at the levels where contaminated soil has the highest concentrations of PCBs.

The travelled portion will be capped with asphalt pavement for the full length.

8.0 Remedial Work Implementation

In the following paragraphs, restrictions on material handling procedures and general guidelines for conducting the work are outlined.

8.1 Material Handling Practices

Due to the nature of the project, special measures are required to minimize exposure of workers to PCB during construction and to avoid taking contaminated material off of the work sites. The workers will be subject to the health and safety requirements as established by the Ministry of labour.

For construction equipment, cross-contamination between contaminated and clean materials will have to be minimized by dividing the construction program into separate and isolated operations for the clean and contaminated materials, as follows:

Operations with Contaminated Materials

- Excavation on road bed, hauling, and dumping on mixing pad
- Mixing operation
- Placing and compacting of soil-cement

Operations with Clean Materials

- Haul and place clean road bed materials
- Excavation and backfilling of disposal site
- All other site work; clearing, stripping topsoil, landscaping

Equipment used in the handling of contaminated materials will have to be assigned to that duty until no longer required and then be thoroughly decontaminated prior to transferring over to operations with clean material. Vehicles handling contaminated materials will not be permitted to leave the work area at the end of the day unless they are first decontaminated.

8.2 Proposed Contract Breakdown

The project is expected to provide opportunities to many local contractors and equipment suppliers. The project logically divides into two parts, as follows:

Contract A - Disposal Site Contract
Includes clearing, excavation and backfill, access road improvements, mixing operation and placing, site restoration, landscaping and supply of cement.

Contract B - Remedial Works Contract
Includes excavation and reconstruction of Lake Clear Road West, excavation and replacement of shoulder on Lake Clear Road East, and excavation and replacement of shoulders on Opeongo Road Crossing.

A third small contract should be let to provide site offices and worker facilities for the project.

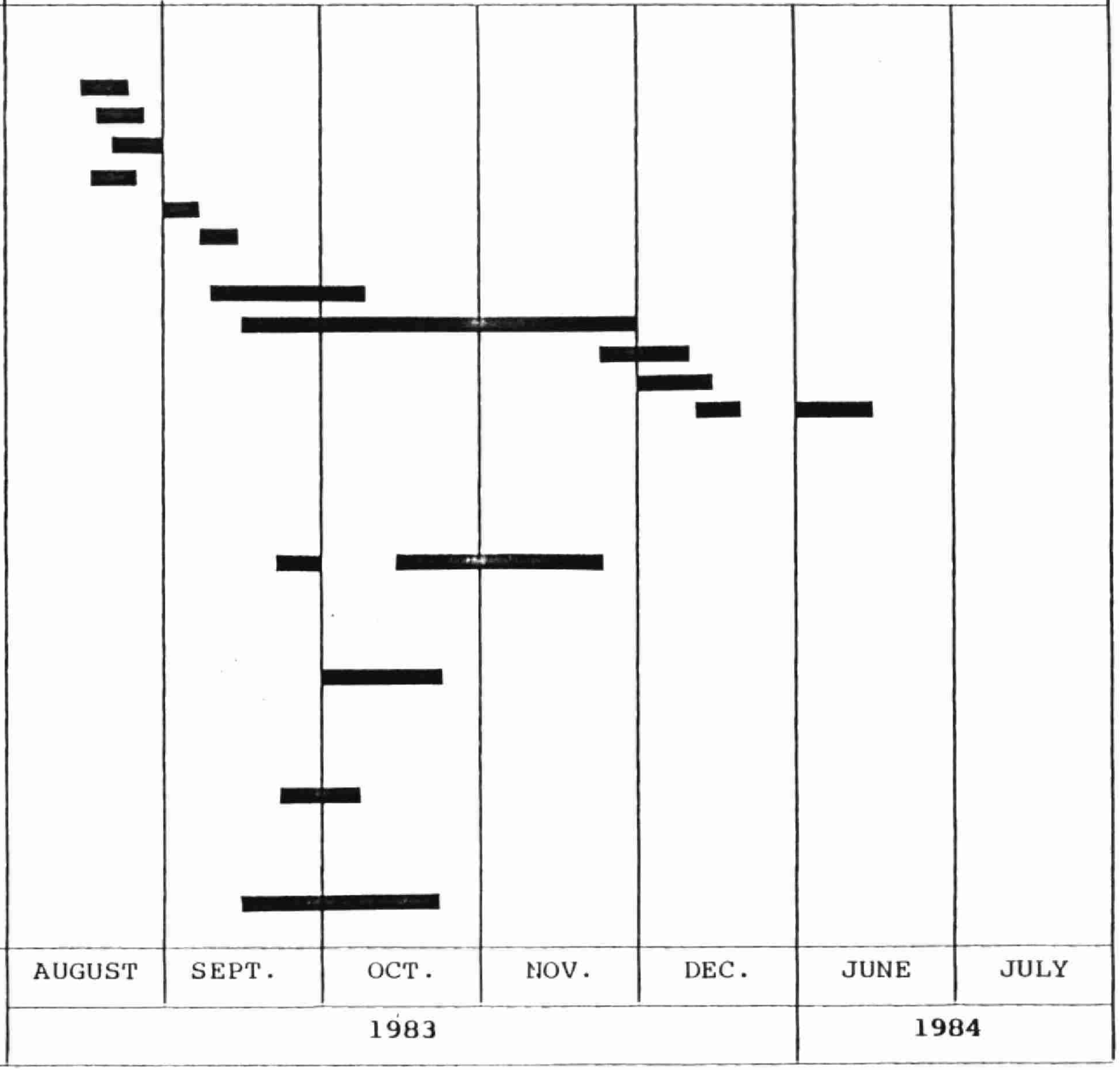
A tentative construction schedule has been prepared and is shown on the following page. It is based on being able to start on August 15 and completed before winter, except for landscaping.

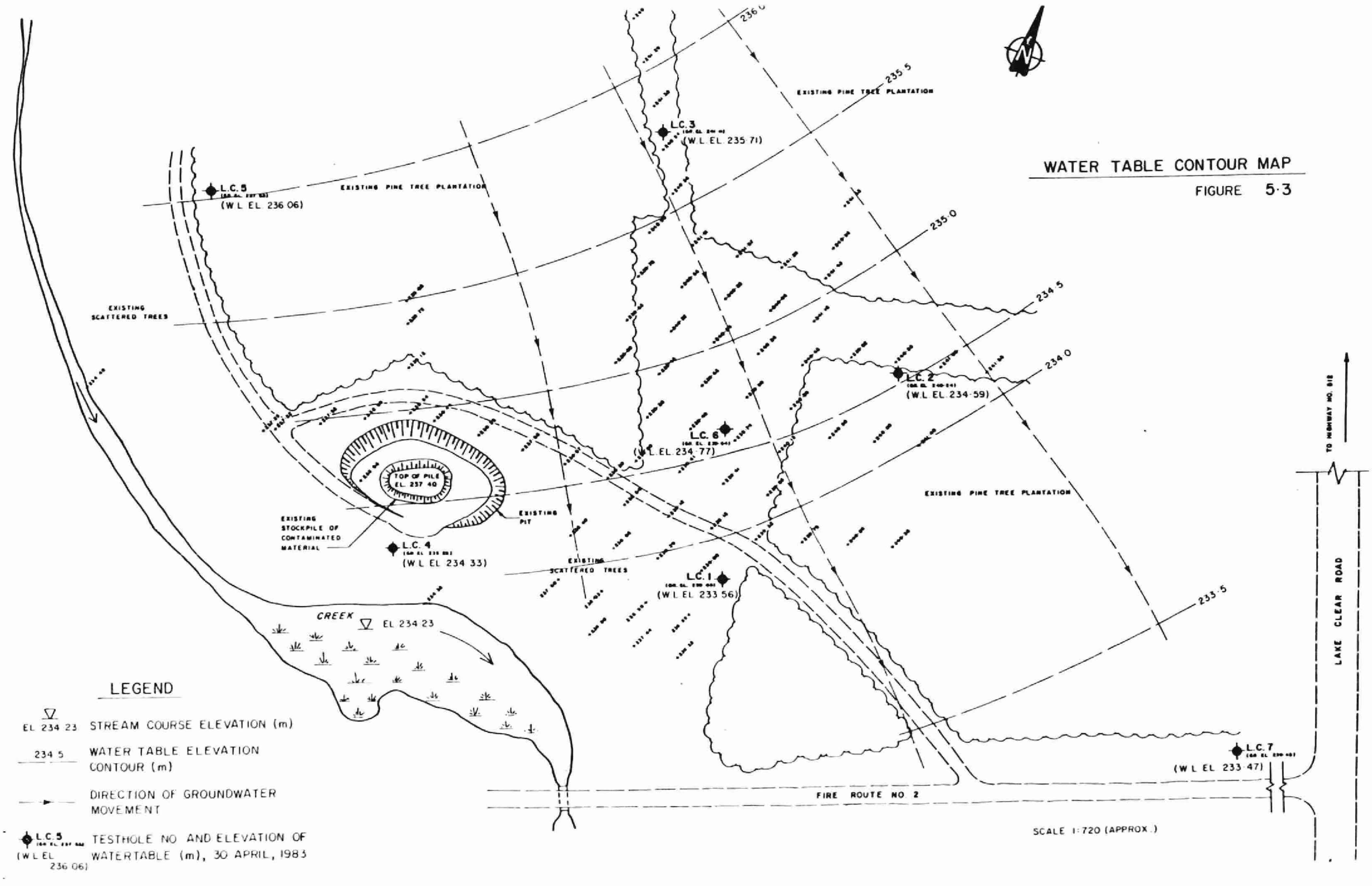
PRELIMINARY CONSTRUCTION SCHEDULE

PROJECT: LAKE CLEAR PCB REMEDIAL WORKS

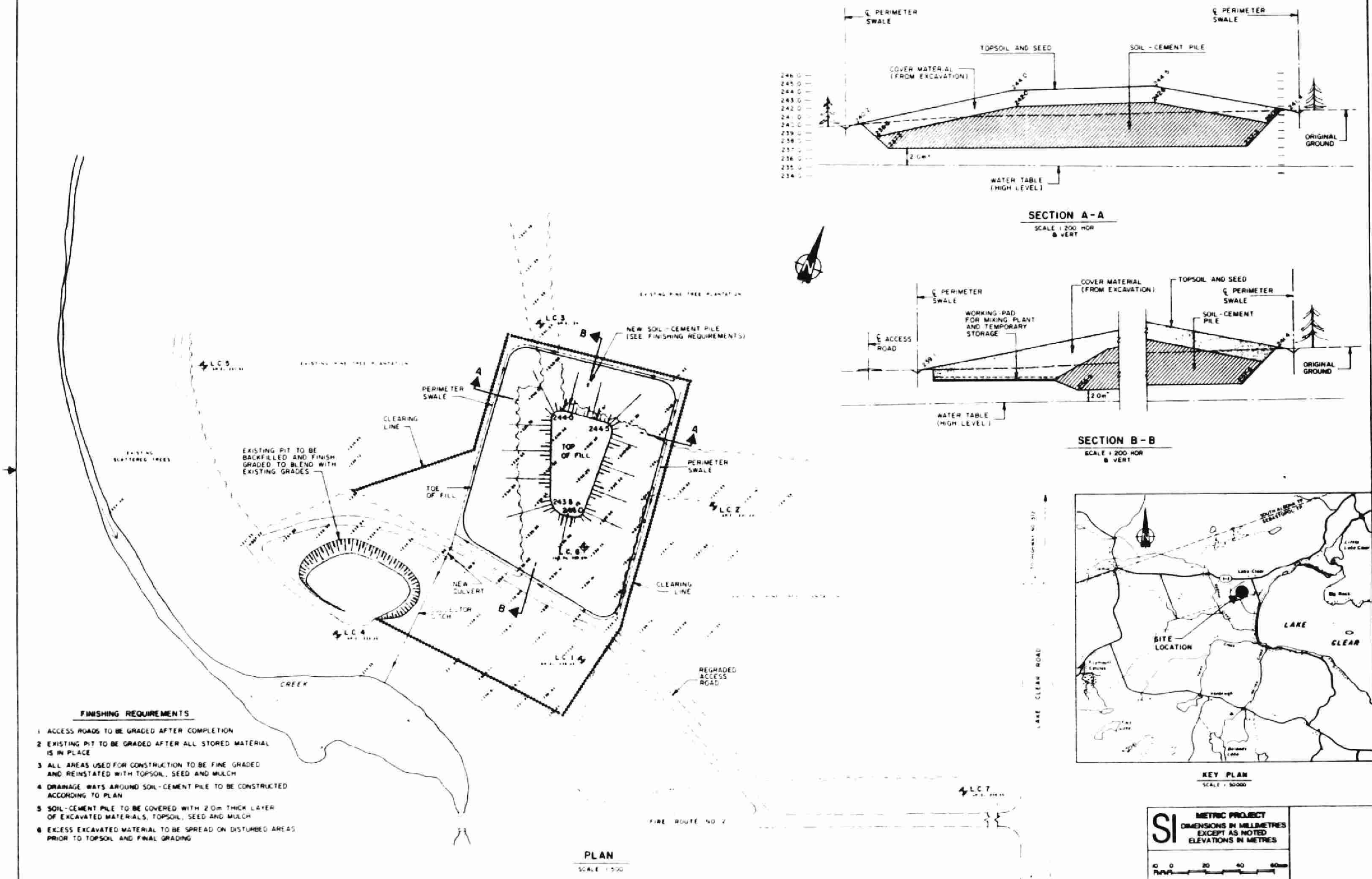
NO.	DESCRIPTION
	CONTRACT A
1.	Site Preparation and Cleaning
2.	Strip and Stockpile Topsoil
3.	Excavate Mixing Plant Area
4.	Improve Access Roads
5.	Install Plant
6.	Mix Contaminated Pile and Build Storage Pad
7.	Excavation of Disposal Area
8.	Mixing Operation
9.	Peak Filling Operation
10.	Final Grading
11.	Clean-Up, Landscaping
	CONTRACT B
1.	Excavate and Rebuild Lake Clear Road West Part
2.	Excavate and Rebuild Lake Clear Road Shoulders East Section
3.	Excavate and Restore Shoulders along Opeongo Road
	RECONSTRUCTION OF FORAN CREEK BRIDGE

CALENDAR PERIOD





WATER TABLE CONTOUR MAP
FIGURE 5·3
236.0
235.5
235.0
234.5
234.0
233.5
EXISTING PINE TREE PLANTATION
EXISTING PINE TREE PLANTATION
EXISTING PINE TREE PLANTATION
L.C.3
(W.L. EL. 235.71)
L.C.5
(W.L. EL. 236.06)
EXISTING SCATTERED TREES
L.C.2
(W.L. EL. 234.59)
L.C.6
(W.L. EL. 234.77)
TOP OF PILE EL. 237.40
EXISTING STOCKPILE OF CONTAMINATED MATERIAL
EXISTING PIT
L.C.4
(W.L. EL. 234.33)
EXISTING SCATTERED TREES
L.C.1
(W.L. EL. 233.56)
CREEK
EL. 234.23
L.C.7
(W.L. EL. 233.47)
FIRE ROUTE NO. 2
TO HIGHWAY NO. 518
LAKE CLEAR ROAD
SCALE 1:720 (APPROX.)
LEGEND
EL. 234.23 STREAM COURSE ELEVATION (m)
234.5 WATER TABLE ELEVATION CONTOUR (m)
DIRECTION OF GROUNDWATER MOVEMENT
L.C.5 (W.L. EL. 236.06) TESTHOLE NO. AND ELEVATION OF WATERTABLE (m), 30 APRIL, 1983



FINISHING REQUIREMENTS

1. ACCESS ROADS TO BE GRADED AFTER COMPLETION
2. EXISTING PIT TO BE GRADED AFTER ALL STORED MATERIAL IS IN PLACE
3. ALL AREAS USED FOR CONSTRUCTION TO BE FINE GRADED AND REINSTATED WITH TOPSOIL, SEED AND MULCH
4. DRAINAGE WAYS AROUND SOIL - CEMENT PILE TO BE CONSTRUCTED ACCORDING TO PLAN
5. SOIL - CEMENT PILE TO BE COVERED WITH 2.0m THICK LAYER OF EXCAVATED MATERIALS, TOPSOIL, SEED AND MULCH
6. EXCESS EXCAVATED MATERIAL TO BE SPREAD ON DISTURBED AREAS PRIOR TO TOPSOIL AND FINAL GRADING

SI METRIC PROJECT
DIMENSIONS IN MILLIMETRES EXCEPT AS NOTED
ELEVATIONS IN METRES

MacLaren

DISPOSAL SITE - FINISHING REQUIREMENTS

DATE | SCALE AS SHOWN

FIGURE 6-1

FILE 38012 - 0 - A1